New Set of Claims

1. The electrochemical cells modules made up of couples of catalytic multilayer porous electrodes forming the anodes and the cathodes and delimitating external gaseous areas and internal areas containing the electrolyte and connected by an external electric circuit characterized in that the cell module comprises:
   - pressure modulators generating in use two pressure cycles independently synchronized but of opposite phase acting at the inlet and at the outlet of the circulating electrolyte,
   - multilayer porous electrodes weeping on the gas side, and
   - means for exchanging heat between the porous electrodes of the cell modules and an external heat source through the electrolyte flowing into the electrochemical cell and fluctuating into the porous electrodes.
2. The electrochemical cell according to claim 1 wherein:
   - the multilayer porous electrodes are conductive and hydrophobic on the gas side,
   - the conductive and catalytic middle layers are hydrophobic and hydrophilic, and
   - the non-conductive, non-catalytic, and preferably hydrophilic, layers are on the electrolyte side.
3. The electrochemical cell according to claims 1 and 2 wherein the pressure modulators are linked with two tanks containing in use the electrolyte at two different pressures and each connected respectively at the inlet and at the outlet of the cell by a valve.
4. The electrochemical cell according to claims 3 wherein the opening section of the outlet valve S and of the inlet valve s are such that S>s.
5. The electrochemical cell according to claims 1-4 wherein the pressure modulators modulate in use at a frequency the period of which approaches the reaction times of the electrochemical reactions.
6. The electrochemical cell according to claims 1 to 5 wherein in use an energy source provides an external continuous current to the porous electrodes such that at the cathode there is H_2 formation and at the anode there is O_2 formation, and in use the electrolyte is an aqueous solution of KOH.

7. The electrochemical cell according to claims 1 to 5 wherein the electrolyte is an aqueous solution of KOH, electric energy is drawn from the porous electrodes by feeding the gas sides of the electrodes with respectively H_2 and O_2.
8. Electrochemical process utilizing the electrochemical cells of claims1 to 7 comprising the following steps:
   - maintaining on the gas side a pressure P up to 200 bar;
   - varying at the internal side discontinuously the electrolyte pressure in the range P+dP and P+dp
   - generating onto the electrolyte pressure positive waves of amplitude dP and dp with the frequency f: when one valve is open the other is closed and vice versa,
   - exchanging heat between the porous electrodes of the cell modules and an external heat source through the electrolyte flowing into the electrochemical cell and fluctuating into the porous electrodes.
9. Electrochemical process according to claim 8 wherein the overpressure are such that $dP > dp$.
10. Electrochemical process according to claim 9 wherein the two overpressures are applied for cycles of length τ_{dP} and τ_{dp} where $\tau_{dP} < \tau_{dp}$ at the frequency $\mathbf{f = 1/T}$ where $\mathbf{T} = \tau_{dP} + \tau_{dp}$.
11. Electrochemical process according to claim 10 wherein the two overpressures are applied at a frequency the period of which approaches the reaction times of the electrochemical reactions.
12. Electrochemical process according to claims 8 to 11 wherein an energy source provides an external continuous current to the porous electrodes such that at the negative electrode there is H_2 formation and at the positive electrode there is O_2 formation and the electrolyte is an aqueous solution of KOH.
13. The electrochemical process according to claims 8 to 11 wherein the electrolyte is an aqueous solution of KOH and electric energy is drawn from the porous electrodes by feeding the gas sides of the electrodes with respectively H_2 and O_2.